RECOMMENDED

RESPIRATORY PROTECTIVE DEVICES

INDIANA STATE BOARD OF HEALTH
DIVISION OF INDUSTRIAL HYGIENE

MAY 1944

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LIST OF RESPIRATORY PROTECTIVE DEVICES APPROVED BY U. S. BUREAU OF MINES[1]

Certification of Approval to January 1, 1943

The following list of respiratory protective devices, their use and care, together with the manufacturers, the U. S. Bureau of Mines approval number, and an illustration where possible, is prepared for the use of industrial plants in Indiana, so that improper respirators will not be purchased for protection against harmful dusts, fumes or mists. Where these toxic materials are present in the air, the Division of Industrial Hygiene of the Indiana State Board of Health recommends the use of one of the following respirators that have been approved by the U. S. Bureau of Mines *for the particular dust, fume or mist present.* However, *this Division does not recommend the use of respirators as the principal control for these harmful substances in the air when it is at all possible to control them by other means,* such as local exhaust at or near the point of origin, wet methods in the case of dusts, enclosed processes, isolation of the process, substitution of a non-toxic for a toxic material, general ventilation or a combination of one or more of these methods.

APPROVAL LABELS

To provide purchasers and users with a means for identifying approved devices and for procuring approved parts when making repairs and replacements, the Bureau requires that all devices marketed under the provisions of the approval system of the Federal Bureau of Mines must have an approval label on which is reproduced the seal of the Bureau, the approval number, the name of the manufacturer to whom the approval is issued, and the conditions for which approval is granted. Essential parts of the devices are marked with the approval number. The markings also obligate the manufacturer to maintain the quality of the product and to construct each device, in all its parts, in exact accordance with specifications of the device that the Bureau examined and approved. Any device that exhibits changes in design or includes any parts that were not in the device approved, regardless of whether the change be made by the manufacturer or the consumer, is not permissible and may not bear the Bureau of Mines approval label.

The approval label (metal plate) is affixed to self-contained oxygen breathing apparatus. Canister-type gas masks bear a label on the case and on each canister, and the approval number is marked on the facepiece and harness, for example, "BM-1400." Type A (hose mask) and Type B (special hose mask without blower) supplied air respirators have the approval label on their cases or containers, and the approval number is marked on the air-supply arrangement, air-supply line, facepiece and harness. Type C (air-line respirator) and Type CE (abrasive-blasting respirator) have the approval label on their cases (if any) or on a special sheet with instructions for use of the device; and the approval number is marked on the air-supply line, respiratory-inlet covering (facepiece, hood, or helmet), and harness. The containers of dispersoid respirators and of replacement-filter units bear approval labels, and the approval number is marked on the facepiece and each filter unit. The filter units also bear a marking that designates the type of particulate matter for which they are approved, as pneumoconiosis-producing and nuisance dusts, toxic dusts and fumes.

THE USE AND CARE OF RESPIRATORS[2]

The term "respirators" or "respiratory protective devices" refers to a large and varied group of protectors worn on the face or over the head of the worker and designed to decrease or eliminate the amount of contaminant (dusts, fumes, mists, gases or vapors) in the inspired air. One type of respirator (the filter type) protects the wearer by filtering out some or all of the harmful material from the inspired air, and a second type (the supplied-air respirator) protects by supplying clean air from a convenient source.

Respirators are not a substitute for general dust or gas control, but are a helpful adjunct. They are used extensively on jobs such as abrasive blasting, paint chipping, handling used storage battery plates, cadmium oxide manufacture, welding operations, spraying of paints and glazes, the manufacture and use of pigments and dyes and the like. Their most important use is under conditions where protection is required intermittently as in cleaning out operations, sweeping, after blasting, in removing cores from large foundry castings, shoveling, screening and handling of materials, and the operation and maintenance of processing equipment.

Respirators should not be considered part of the worker's wearing apparel. They are safety devices and should be supplied by the employer. The employer's duty does not stop with the purchase of respirators. He must see that they are distributed to all employees who need them. The

(1) This listing and discussion of the characteristics of respiratory protective devices (except chemical cartridge respirators) is reprinted with permission of U. S. Bureau of Mines from their circular 7237 (March 1943).

(2) This section on "The Use and Care of Respirators" is reprinted with permission of the Industrial Hygiene Foundation, Pittsburgh, Pa., from their Preventive Engineering Series Bulletin No. 2, Part 2.

workers must be told when to use respirators. They must be educated in their proper use—a difficult task which is accomplished only by incessant instruction.

Compared to other methods of dust and fume control, respirators are inexpensive. Consequently, little or no thought is sometimes given to their maintenance. Only too frequently good respirators are purchased, distributed carefully, and then forgotten. In a short time, they are very dirty and function ineffectively, if at all.

It is important that respirators be maintained in good working condition. Any respirator which is not properly kept will soon become very dirty and ineffective. The worker will object to wearing a dirty or unsightly respirator. Furthermore, if the respirator is not properly maintained, it will soon become defective and will not afford the necessary protection, even if worn correctly and continuously. A defective respirator is worse than none because the wearer is given a false feeling of security, and will not take the precaution which he would take if he had no respirator.

There are two general systems of respirator maintenance today. They are (1) individual maintenance and (2) central maintenance. In the individual maintenance system, the care and upkeep of the respirator is left to the user. He is supposed to wash, sterilize and repair the respirator. In the central maintenance system, all respirators are assembled at one central point for cleaning and repairing.

Usually the central maintenance system is worked out somewhat as follows. Each worker who needs respiratory protection is supplied with two respirators. The respirators are marked with the employment number of the user. Respirators may be marked by stamping the number on metal parts; riveting metal number plates on the rubber masks, and sewing laundry tabs on the headbands. When he goes on shift, the worker picks up from a dust free storage container (example—cellophane bag) a clean and serviced respirator identified by name or employment number. At the close of work he returns the now dirty respirator to a central collection point. The dirty respirators are all collected by one man who cleans and repairs them in a room laid out for this purpose. One respirator per worker is sufficient if the maintenance is carried out between shifts. Usually, however, two respirators are supplied and the repairs and cleaning done by one man on the regular shift. The worker in charge of the respirator maintenance need not be a new or special worker. It may be the man in charge of the stock room, or any individual whose work will permit. Frequently the maintenance of respirators can be combined with that of other protective equipment such as goggles and protective hats. In some industries where relatively few respirators are in use, the maintenance is one of the duties of the nurse. If possible this is highly recommended.

The advantages of the central over the individual system are obvious. Each worker has a clean, well-kept respirator daily. He will object less to wearing it, and will get real protection at all times. The monetary saving effected by the increased life of the parts and decreased need for new respirators will usually more than offset the additional cost (if any) of setting up and maintaining the central system.

The idea of a central maintenance bureau is not a new one. Such bureaus have been in use in a score or more industries for several years. The results produced as evidenced by the condition of the respirators and the apparent satisfaction of the users are remarkable.

Respirator maintenance usually consists of cleaning, sterilizing and repairing. Effective methods of cleaning and sterilization are as follows:

1. Remove filters, felt screens and head bands (if elastic).
2. Wash with a brush and soap in warm water.
3. Sterilize by (a) immersion for ten minutes in a solution of formalin made by placing 1 part of 40 per cent formaldehyde solution into 9 parts of water or

   (b) Dip in a 3 per cent solution of carbolic acid, a 2 per cent solution of lysol, or a 70 per cent solution of denatured alcohol, or

   (c) Subject the respirator to sterilization by a moist atmosphere of antiseptic gas, preferably formaldehyde, for a period of ten minutes at room temperature.
4. Following any one of the outlined procedures, the respirator must be rinsed in clear water and hung to dry.

Many dust respirators employ so-called "long life" filters which are intended to be used over and over. Such filters are cleaned by blowing the dirt or dust off with compressed air; by brushing the surface; or by tapping the filter. If the filters are moist, they must be dried before the dust can be removed effectively. To remove grease and the like, the dust filter discs may be dipped in a dry cleaning solution for a very short time. This process should be carried out only infrequently because it decreases the life of the filter.

Dust, Fume and Mist Respirators approved by U. S. Bureau of Mines
since publication of this bulletin which extends approval date of
Bulletin to September, 1945.

Type A: Pneumoconiosis - Producing and Nuisance Dust Respirators.

1. CESCO RESPIRATOR NO. 94. Approval BM-2153, issued to Chicago Eye Shield Co., March 23, 1945.

mk
12/26/45

DUST, FUME AND MIST RESPIRATORS

For the purpose of these approvals, the following definitions of the terms, "dust," "fume," and "mist" are used.

Dust—Dispersoids or particulate matter, smaller than 0.1 mm. or 100 microns, formed by the disintegration of dry solid materials by such processes as crushing, grinding and abrading.

Fume—Solid dispersoids formed by the condensation of vapors such as those from heated metals and other substances.

Mist—Liquid dispersoids formed by the disintegration of a liquid by such processes as spray-coating and atomizing.

TYPE A

Pneumoconiosis-Producing or Nuisance Dust Respirators

These respirators are approved only for protection against the inhalation of pneumoconiosis—(silicosis and asbestosis)—producing dusts, such as free silica, and asbestos, and nuisance dusts, such as aluminum, cellulose, cement, charcoal, coal, coke, flour, gypsum, iron ore, limestone and wood.

These respirators are *NOT* approved for protection against metals or their compounds (such as antimony, arsenic, cadmium, chromium, lead, manganese, mercury, selenium, tellurium, thalium, uranium and vanadium), or protection against harmful smokes and fumes.

1. M.S.A. Comfo Respirator. Approval BM-2101 ..... MSA*
2. Willson Bag Respirator No. 300. Approval BM-2102 ..... WP
3. Willson Bag Respirator No. 400. Approval BM-2103 ..... WP
4. Pulmosan M-15 Pouch-Type Filter Respirator. Approval BM-2104 ..... PSE
5. Biever Respirator. Approval BM-2105 ..... SSE
6. Willson Bag Respirator No. 4. Approval BM-2106 ..... WP
7. Pulmosan M-1100 Pouch-Type Filter Respirator. Approval BM-2109 ..... PSE
8. Cover No. 24 Dupor Respirator. Approval BM-2111 ..... HSC
9. Cesco No. 90 Healthguard Respirator. Approval BM-2113 ..... CES
10. McDonald Dustfoe Respirator. Approval BM-2115 ..... BFMcD
11. M.S.A. Dustfoe Respirator. Extension of approval BM-2115 ..... MSA
12. Willson Bag Respirator No. 100. Approval BM-2117 ..... WP
13. Willson Rotiform Respirator No. 200. Approval BM-2118 ..... WP
14. Willson Respirator No. 750. Approval BM-2119 ..... WP
15. Pulmosan D-4100 Duo-Filter Respirator. Approval BM-2120 ..... PSE
16. A. O. R1000 Respirator. Approval BM-2121 ..... AO
17. Hygeia Filto-Ring No. 28 Respirator. Approval BM-2122 ..... HF
18. Cover Dupor Skin-A-Cat Respirator No. 40. Approval BM-2129 ..... HSC
19. M.S.A. Comfo Respirator. Approval BM-2130 ..... MSA
20. McDonald Dustfoe Respirator. Approval BM-2132 ..... BFMcD
21. M.S.A. Dustfoe Respirator. Extension of approval BM-2132 ..... MSA
22. M.S.A. Alkali-Dust Respirator. Approval BM-2136 ..... MSA
23. A. O. R9100 Respirator. Approval BM-2137 ..... AO
24. Willson Respirator No. 5. Approval BM-2140 ..... WP
25. DeVilbiss MSD Respirator. Approval BM-2141 ..... DeV
26. Willson Respirator No. 10. Approval BM-2146 ..... WP

Photographs of approved Type A Dust respirators are shown in figures 1, 2 and 4, pp. 5, 6, and 8.

TOXIC DUST

Toxic Dust Respirators

These respirators are approved for protection against all toxic or poisonous metallic dusts, such as lead, cadmium, arsenic, chromium, manganese, selenium, vanadium and their compounds.

These respirators are *NOT* approved for protection against fumes generated by heating and volatilization, such as fumes generated in lead burning and soldering, smelting, type founding, and fusing lead glaze and enamel.

1. M.S.A. Comfo Respirator. Approval BM-2107 ..... MSA*
2. Pulmosan L-2100 Pouch-Type Filter Respirator. Approval BM-2110 ..... PSE
3. Willson Rotiform Respirator No. 200L. Approval BM-2123 ..... WP
4. Willson Respirator No. 750L. Approval BM-2125 ..... WP
5. McDonald Dustfoe Respirator. Approval BM-2126 ..... BFMcD

* Initials of manufacturer.

6. M.S.A. Dustfoe Respirator. Extension of approval BM-2126 ..... MSA
7. Willson Respirator No. 5L. Approval BM-2143 ..... WP
8. A. O. R9100T Respirator. Approval BM-2144 ..... AO
9. Hygeia Reef No. 12 Respirator. Approval BM-2145 ..... HF

Photographs of approved Toxic Dust Respirators are shown in figure 3, p. 7.

TYPE A AND TOXIC DUST

Type A and Toxic Dust Respirators

Protection against a combination of Type A and Toxic Dust. *NO* protection as listed under Type A and Toxic Dust.

1. Willson Bag Respirator No. 400L. Approval BM-2108 ..... WP*
2. Pulmosan ML-3100 Pouch-Type Filter Respirator. Approval BM-2112 ..... PSE
3. Cesco Healthguard No. 91 Respirator. Approval BM-2114 ..... CES
4. Cesco Healthguard No. 92 Respirator. Approval BM-2116 ..... CES
5. Cover Dupor No. 46 Respirator. Approval BM-2124 ..... HSC
6. Willson Respirator No. 752L. Approval BM-2127 WP
7. M.S.A. Comfo Respirator. Approval BM-2133 MSA
8. McDonald Dustfoe Respirator. Approval BM-2134 ..... BFMcD
9. M.S.A. Dustfoe Respirator. Extension of approval BM-2134 ..... MSA
10. A. O. R1000T Respirator. Approval BM-2138 ..... AO
11. Cesco Healthguard No. 94 Respirator. Approval BM-2142 ..... CES
12. McDonald Clear-Vue Dustfoe Respirator. Approval BM-2148 ..... BFMcD
13. M.S.A. Clear-Vue Dustfoe Respirator. Extension of approval BM-2148 ..... MSA

Photographs of approved Type A and Toxic Dust Respirators are shown in figure 4, p. 8.

TYPE B

Fume Respirators

These respirators are approved for protection against the inhalation of fumes (solid dispersoids or particulate matter) formed by the condensation of vapors such as those from heated substances and from heated metals including lead, manganese, magnesium, aluminum, antimony, arsenic, copper, chromium, iron, cadmium and zinc.

These respirators are *NOT* approved for protection against harmful gases, vapors or an insufficiency of oxygen.

1. Willson Respirator No. 770. Approval BM-2128 ..... WP*
2. M.S.A. Comfo Respirator. Approval BM-2139 ..... MSA
3. Willson Respirator No. 570. Approval BM-2149 ..... WP

Photographs of approved Fume Respirators are shown shown in figure 3, p. 7.

Pneumoconiosis-Producing Dust and Mist and Chromic Acid Mist Respirators

These respirators are for protection against the inhalation of pneumoconiosis-producing dusts, such as free silica and asbestos; nuisance dusts, such as aluminum, cellulose, cement, charcoal, coal, coke, flour, gypsum, iron ore, limestone and wood; pneumoconiosis-producing mist, such as is produced by spray coating and atomizing; and chromic acid mist, such as is produced in chromium plating.

1. M.S.A. Comfo Respirator. Extension of approval BM-2101 ..... MSA*
2. Willson Respirator No. 750. Extension of approval BM-2119 ..... WP
3. M.S.A. Comfo Respirator. Approval BM-2130 ..... MSA
4. McDonald Dustfoe Respirator. Approval BM-2132 ..... BFMcD
5. M.S.A. Dustfoe Respirator. Extension of approval BM-2132 ..... MSA
6. Willson Respirator No. 5. Approval BM-2140 ..... WP
7. McDonald Clear-Vue Dustfoe Respirator. Approval BM-2147 ..... BFMcD
8. M.S.A. Clear-Vue Dustfoe Respirator. Extension of approval BM-2147 ..... MSA

Photographs of approved dispersoid respirators are shown in figures 1, 2, 3 and 4, pp. 5, 6, 7, and 8.

* Initials of manufacturer.

PNEUMOCONIOSIS-PRODUCING AND NUISANCE DUST RESPIRATORS

M. S. A. Comfo
BM-2101* — 1-7-35
FP—I°—FI°
BM-2130* — 8-23-39
P—I°—FI°

Willson No. 300
BM-2102 — 1-21-35
F—I—FI°

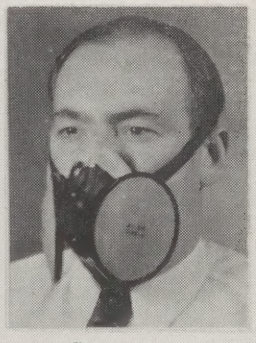
Willson No. 400
BM-2103 — 1-21-35
F—I—FI°

Pulmosan M-15
BM-2104 — 2-9-35
F—I

Biever
BM-2105 — 3-5-35
F—I

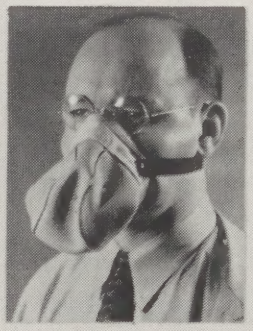
Willson No. 4
BM-2106 — 5-27-35
F—I—FI°

Pulmosan M-1100
BM-2109 — 3-23-36
F—I

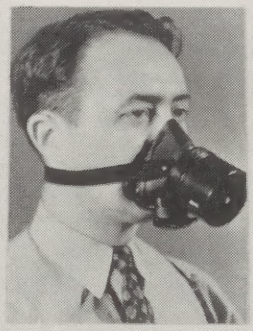


Cover No. 24
BM-2111 — 9-15-36
F—FI°

McDonald and M.S.A.
Dustfoe
BM-2115 — 10-8-37
FP—I—FI°
BM-2132* — 8-23-39
P—I—FI°



Willson No. 100
BM-2117 — 12-27-37
F—FI



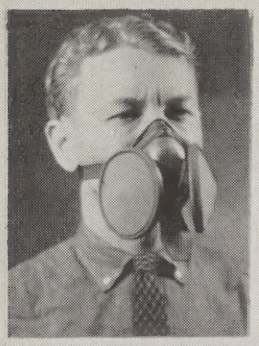
Willson No. 200
BM-2118 — 12-30-37
F—I—FI°

Willson No. 750
BM-2119* — 1-3-38
P—I—FI°

*These respirators are also approved for pneumoconiosis-producing, chromic acid, and nuisance mists.
CODE: F = felt filter; P = paper; and FP = felt + paper. I = inhalation valves.
FI = facelet. ° = use of indicated part is optional.

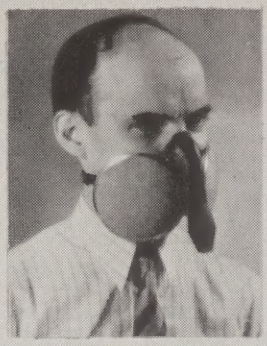
Figure 1

PNEUMOCONIOSIS-PRODUCING AND NUISANCE DUST RESPIRATORS (Continued)

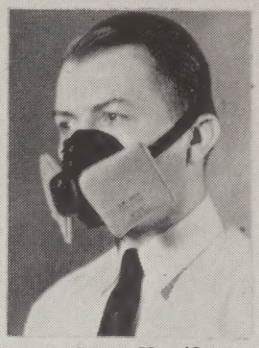


Pulmosan D-4100
BM-2120 — 1-12-38
F

A. O. R1000
BM-2121 — 2-3-38
F—I



Hygeia No. 28
BM-2122 — 3-23-38
F

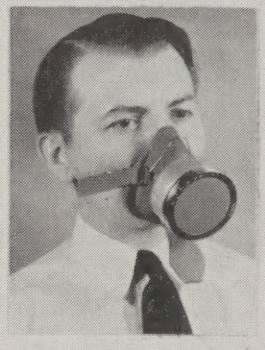


Cover No. 40
BM-2129 — 7-5-39
F—I—FI°

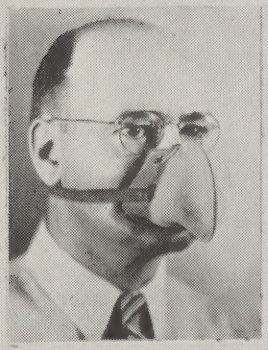
M.S.A. Alkali Dust
BM-2136 — 12-1-39
P—I

A. O. R9100
BM-2137 — 3-6-40
F

Willson No. 5
BM-2140* — 9-28-40
P—I



DeVilbiss MSD
BM-2141 — 10-3-40
F—I



Willson No. 10
BM-2146 — 9-11-41
F—I—FI°

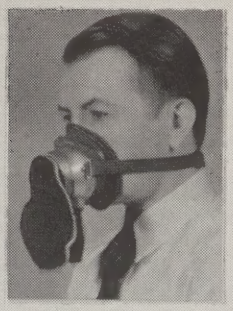
McDonald and M.S.A.
Clear-Vue Dustfoe
BM-2147* — 7-16-42
P—I

*These respirators are also approved for pneumoconiosis-producing, chromic acid, and nuisance mists.
CODE: F = felt filter; P = paper; and FP = felt + paper. I = inhalation valves.
FI = facelet. ° = use of indicated part is optional.

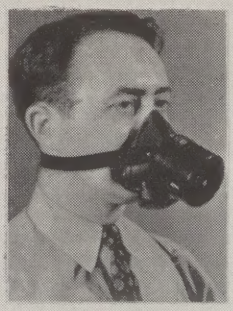
Figure 2

TOXIC DUST RESPIRATORS

M. S. A. Comfo
BM-2107 — 8-9-35
FP—I°—FI°

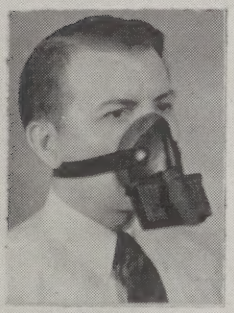


Pulmosan L-2100
BM-2110 — 7-17-36
F—I

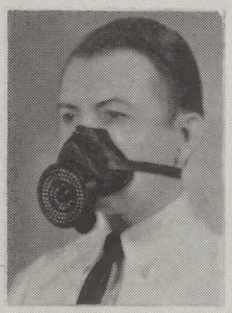


Willson No. 200L
BM-2123 — 4-18-38
F—I—FI°

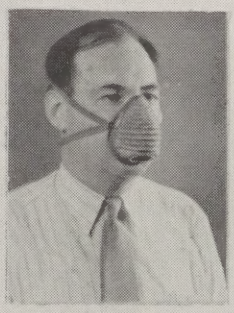
Willson No. 750L
BM-2125 — 10-19-38
P—I—FI°



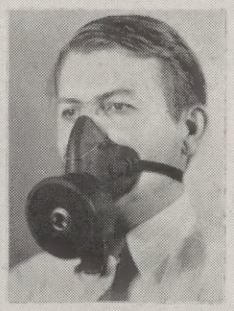
McDonald and M.S.A.
Dustfoe
BM-2126 — 3-10-39
FP—I—FI°



Willson No. 5L
BM-2143 — 12-19-40
P—I

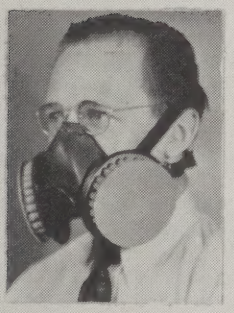


A. O. R9100T
BM-2144 — 5-19-41
F

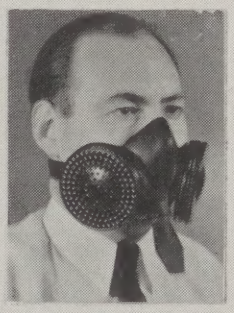


Hygeia No. 12
BM-2145 — 7-15-41
P—I

FUME RESPIRATORS



Willson No. 770
BM-2128 — 4-15-39
F—I



M. S. A. Comfo
BM-2139 — 3-27-40
P—I°

Willson No. 570
BM-2149* — 8-7-42
P—I—FI°

*This respirator is also approved for all dusts and for pneumoconiosis-producing, chromic acid, and nuisance mists.

MIST RESPIRATORS—(See footnotes for Pneumoconiosis-Producing and Nuisance, Dust Respirators, and Fume Respirators).

CODE: F = felt filter; P = paper; and FP = felt + paper. I = inhalation valves. FI = facelet. ° = use of indicated part is optional.

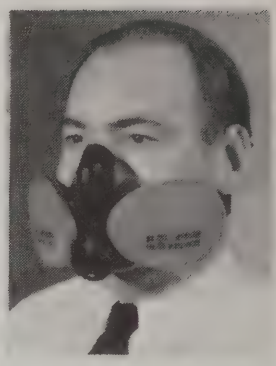
Figure 3

DUST RESPIRATORS—(for all dusts)

Willson No. 400L
BM-2108 — 9-5-35
F—I—FI°

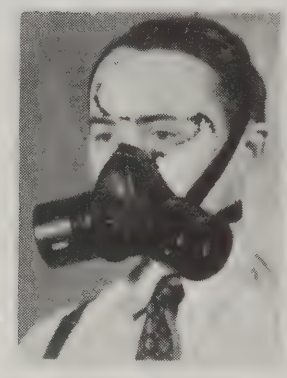
Pulmosan ML-3100
BM-2112 — 11-30-36
F—I

Cesco No. 91
BM-2114 — 8-6-37
F—I



Cesco No. 92
BM-2116 — 11-8-37
F—I°

Cover No. 46
BM-2124 — 10-3-38
F—I—FI°

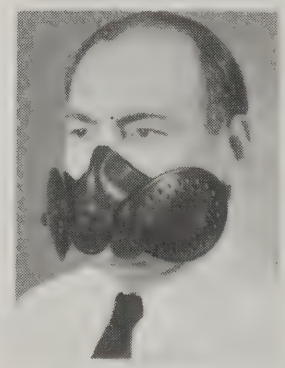


Willson No. 752L
BM-2127 — 3-10-39
F—I—FI°

M. S. A. Comfo
BM-2133 — 10-13-39
P—I°—FI°

M. S. A. Comfo
Navy type facepiece
I°

A. O. R1000T
BM-2138 — 3-16-40
F—I



Cesco No. 94
BM-2142 — 10-3-40
P

McDonald and M.S.A.
Clear-Vue Dustfoe
BM-2148 — 7-21-42
P—I

McDonald and M.S.A.
Dustfoe
BM-2134 — 10-13-39
P—I—FI°

CODE: F = felt filter; P = paper; and FP = felt + paper. I = inhalation valves.
FI = facelet. ° = use of indicated part is optional.

Figure 4

. . .

Chemical Cartridge Respirators approved by U. S. Bureau of Mines since publication of this bulletin which extends approval date of bulletin to September, 1945.

Type B: Organic Vapor Chemical Cartridge Respirators.

These respirators are approved for respiratory protection in atmospheres not immediately dangerous to life or containing not more than one tenth (0.1) percent organic vapors by volume.

1. M. S. A. TWIN CARTRIDGE TYPE RESPIRATOR G. M. A. Approval BM-2301, issued to Mine Safety Appliance Co., June 4, 1945.

WILLSON NO. 701 CHEMICAL CARTRIDGE RESPIRATOR. Approval BM-2302, issued to Willson Products Inc., August 27, 1945.

CHEMICAL CARTRIDGE RESPIRATORS[3]

Although chemical cartridge respirators have not as yet been approved by the U. S. Bureau of Mines, they do offer effective protection against light concentrations of acid gases and organic vapors, provided that the proper type of chemical cartridge is used and the cartridge be replaced with new cartridge IMMEDIATELY by wearer upon noting odor. The noticing of an odor by wearer indicates cartridge is exhausted and will give no further protection. The use of filters in front of cartridge will prevent clogging and should prolong life of cartridge.

Under no conditions should these respirators be used in atmospheres deficient in oxygen, or where the presence of carbon monoxide or oxides of nitrogen are suspected, or where the toxic fume or vapor is odorless.

These respirators are not to be used as substitutes for air line respirators, gas masks or local exhaust ventilation systems. Neither are these respirators to be used for the protection against any toxic material which is not listed herein unless the respirator manufacturer has stipulated that the cartridge will completely absorb the toxic material in question.

Organic Vapors

Respiratory protection for exposures to *light concentrations* of the following:

Acetaldehyde
Acetone
Acrolein
Alcohols
Aldehydes
Acetates
Benzine
Benzol
Carbon Bisulfide
Carbon Tetrachloride
Chloroform
Chloropicrin
Creosote
Esters
Ethers
Ethyl Chloride
Ethyl Bromide
Formaldehyde
Furfural
Gasoline
Kerosene
Ketones
Lacquers
Naphtha
Nitrobenzene
Petroleum Spirits
Phenol
Tar
Toluol
Trichlorethylene
Turpentine

1. Willson Chemical Cartridge Respirators—No. 701 and No. 711 ..... WP*
2. M.S.A. Chemical Cartridge Respirators—No. CR-9281, No. EM-9328 ..... MSA

Photographs of recommended chemical cartridge respirators are shown in figure 5, p. 10.

Acid Gases

Respiratory protection for exposures to *light concentrations* of the following:

Acetic Acid
Hydrochloric Acid
Hydrogen Sulphide
Nitric Acid
Sulphuric Acid
Sulphur Dioxide
Sulphur Trioxide

1. Willson Chemical Cartridge Respirators—Nos. 702 and 712 ..... WP*
2. M.S.A. Chemical Cartridge Respirators—Nos. EM-9328, CR-10373 ..... MSA

Photographs of recommended chemical cartridge respirators are shown in figure 5, p. 10.

Organic Vapors and Acid Gases

Respiratory protection for exposure to *light concentrations* of the above plus the following:

Bromine
Chlorine
Dimethyl Sulfate
Fluorine
Phosgene
Pentachloride
Phosphorus
Phosphorus Trichloride
Sulphur Chloride
Stannic Chloride
Thiophosgene
Toluidine

1. Willson Chemical Cartridge Respirators—Nos. 703 and 713 ..... WP*
2. M.S.A. Chemical Cartridge Respirators—Nos. CR-10373, EM-9328 ..... MSA

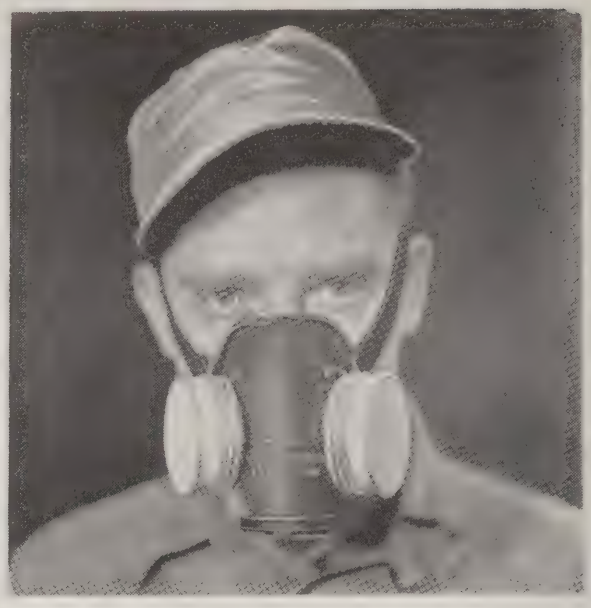
Photographs of recommended chemical cartridge respirators are shown in figure 5, p. 10.

* Initials of manufacturer.

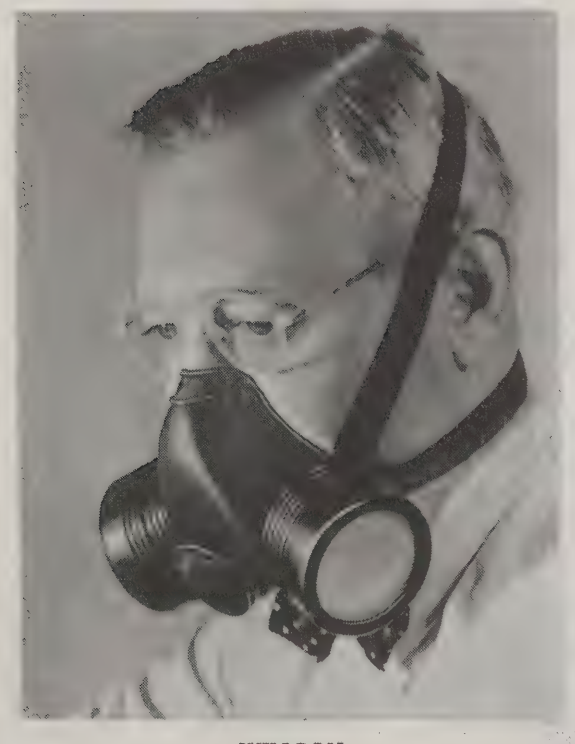
(3) Chemical cartridge respirators are not approved by the U. S. Bureau of Mines.

CHEMICAL CARTRIDGE RESPIRATORS

M.S.A. Twin Cartridge Respirator
"Comfo"-type facepiece
No. CR-9281, No. CR-10373



M.S.A. Twin Cartridge Respirator
"U. S. Navy"-type facepiece
No. EM-9328



WILLSON
Nos. 701, 702, 703
Twin Cartridges 95 cc each

WILLSON
Nos. 711, 712, 713
Twin Cartridges 50 cc each

Figure 5

GAS MASKS

NOTE: *No gas mask gives protection when there is a deficiency of oxygen.*

TYPE A

Acid Gas Masks

Protection against acid gases, such as chlorine, formic acid, hydrogen chloride, hydrogen sulfide, phosgene and sulfur dioxide.

1. M.S.A. Hydrocyanic Acid Gas Mask. Approvals BM-1413 (regular-size canister) and BM-1414 (supersize canister) ..... MSA*
2. Acme Chlorine Gas Mask. Approval BM-1421 .. APE
3. M.S.A. Chlorine Gas Mask. Approval BM-1422 .. MSA
4. Davis Hydrocyanic Acid Gas Mask. Approval BM-1424 ..... DEE
5. Willson Chlorine Gas Mask. Approval BM-1426 WP
6. Davis Chlorine Gas Mask. Approval BM-1427 DEE
7. Willson Hydrocyanic Acid Gas Mask. Approval BM-1428 ..... WP
8. Bullard Chlorine Gas Mask. Approval BM-1430 EDB
9. Bullard Hydrocyanic Acid Gas Mask. Approval BM-1431 ..... EDB

TYPE B

Organic Vapor Masks

Protection against organic vapors, such as acetone, alcohols, aniline, benzene, carbon bisulfide, carbon tetrachloride, chloroform, ether, formaldehyde, gasoline and petroleum distillates and similar volatile compounds.

1. M.S.A. Organic Vapor Mask. Approval BM-1415 ..... MSA*
2. Davis Organic Vapor Mask. Approval BM-1417 DEE
3. Acme Organic Vapor Mask. Approval BM-1418 APE
4. Bullard Organic Vapor Mask. Approval BM-1419EDB
5. Willson Organic Vapor Mask. Approval BM-1423 WP

TYPE AB

Acid Gas and Organic Vapor Masks

Protection against a combination of A and B—see above.

1. M.S.A. Acid Gas and Organic Vapor Mask. Approval BM-1409 ..... MSA*
2. M.S.A. Hydrogen Sulfide and Petroleum Vapor Mask. Approved BM-1410 ..... MSA
3. Davis Acid Gas and Organic Vapor Mask. Approval BM-1411 ..... DEE
4. M.S.A. Hydrogen Sulfide and Petroleum Vapor Mask. Approval BM-1412 ..... MSA
5. M.S.A. Hydrogen Sulfide and Petroleum Vapor Mask. Approval BM-1416 ..... MSA

TYPE C

Ammonia Gas Masks

Protection against ammonia gas.

1. M.S.A. Ammonia Gas Mask. Approval BM-1401 ..... MSA*
2. M.S.A. Ammonia Gas Mask. Approval BM-1404 MSA
3. LaFrance Ammonia Gas Mask. Extension of approval BM-1401 ..... ALaF
4. M.S.A. Ammonia Gas Mask. Approval BM-1406 MSA
5. Davis Ammonia Gas Mask. Approval BM-1408 DEE
6. LaFrance Ammonia Gas Mask. Extension of approval BM-1408 ..... ALaF
7. McDonald Ammonia Gas Mask. Extension of approval BM-1406 ..... BFMcD
8. Acme Ammonia Gas Mask. Approval BM-1420 APE
9. Willson Ammonia Gas Mask. Approval BM-1425 WP
10. Bullard Ammonia Gas Mask. Approval BM-1429 EDB

* Initials of manufacturer.

TYPE D

Carbon Monoxide Gas Masks

Protection against carbon monoxide gas.

1. M.S.A. Self-Rescuer. Approval BM-1402 .... MSA*

TYPE N

Universal Gas Masks

Universal gas masks with filters that afford respiratory protection against smokes from ordinary fires and limited respiratory protection against dusts, fumes, mists, and fogs, but do not afford respiratory protection against the toxic smokes of warfare.

1. M.S.A. All-Service Gas Mask. Approval BM-1403 ..... MSA*
2. M.S.A. All-Service Gas Mask. Approval BM-1405 ..... MSA
3. McDonald All-Service Gas Mask. Extension of approval BM-1405 ..... BFMcD
4. Willson WUG-N1 Universal Gas Mask. Approval BM-1432 ..... WP
5. Acme All Purpose Gas Mask. Approval BM-1435 APE

* Initials of manufacturer.

Universal gas masks with filters that afford respiratory protection against toxic dusts, fumes, mists, fogs and smokes.

1. Willson WUG-N2 Universal Gas Mask. Approval BM-1433 ..... WP*
2. M.S.A. All-Service, Model S, Gas Mask. Approval BM-1434 ..... MSA

Photographs of typical approved gas masks are shown in figure 6, p. 13.

Gas Masks approved by U. S. Bureau of Mines since publication of this bulletin which extends approval date of bulletin to September, 1945.

Type N: Universal Gas Masks

Universal gas masks with filters that afford respiratory protection against smokes from ordinary fires and limited respiratory protection against dusts, fumes, mists, and fogs but do not afford respiratory protection against the toxic smokes of warfare.

1. BULLARD UNIVERSAL GAS MASK. Approval BM-1439, issued to E. D. Bullard Co., May 16, 1945.

. . . . . .

Universal gas masks with filters that afford respiratory protection against toxic dusts, fumes, mists, fogs, and smokes.

1. ACME MODEL FD UNIVERSAL GAS MASK. Approval BM-1436, issued to Acme Protection Equipment Co., Inc., October 27, 1943.

2. BULLARD UNIVERSAL GAS MASK. Approval BM-1440, issued to E. D. Bullard Co., May 16, 1945.

. . . . . .

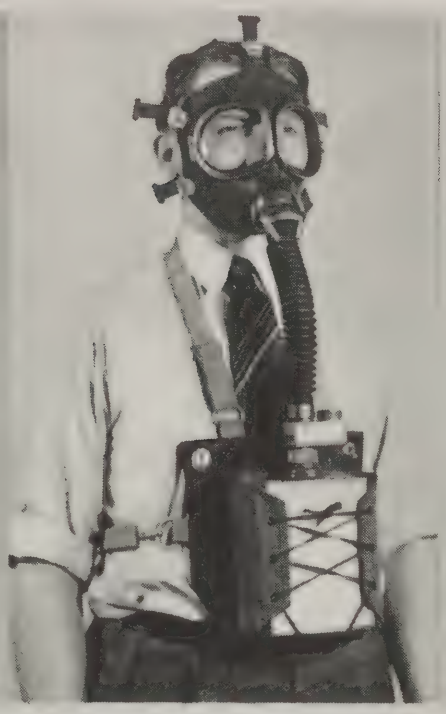
Type B: Organic Vapor Gas Masks

1. WILLSON ORGANIC VAPOR MASK (large Canister). Approval BM-1437, issued to Willson Products Inc., August 5, 1944.

. . .

TYPICAL APPROVED GAS MASKS

Willson Universal Gas Mask,
WUG-N1 BM-1432

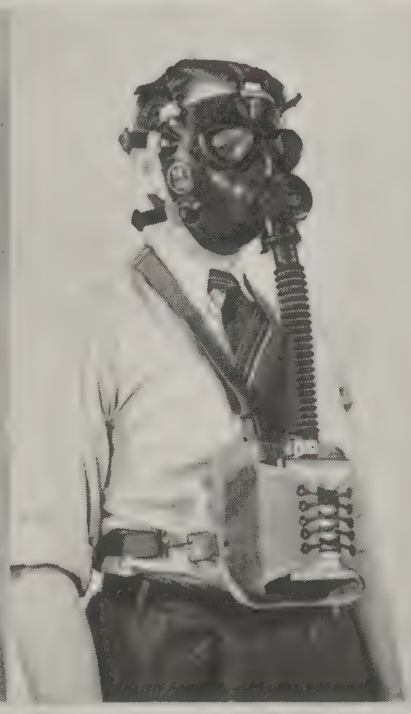


M.S.A. All Service Gas Mask,
Model S BM-1434

Acme All-Purpose Gas Mask,
Type N BM-1435

La France Ammonia Mask,
BM-1401

Davis Organic Vapor Mask,
BM-1417



Bullard Organic Vapor Mask,
BM-1419

Figure 6

SUPPLIED-AIR RESPIRATORS
TYPE A SUPPLIED-AIR RESPIRATORS

Bullard Hose Mask,
BM-1903

M.S.A. Combination Hose Mask,
BM-1905A

La France Fresh Air Mask,
Model A BM-1905A

Davis Hose Mask,
BM-1906

Acme Supplied-Air Respirator,
Type A BM-1910

Figure 7

SUPPLIED AIR RESPIRATORS

TYPE A

Hose Masks

Respiratory protection against *deficiency of oxygen and all harmful gases, vapors, fumes, dusts, smokes and mists.*

1. M.S.A. Combination Hose Mask. Approval BM-1901 ..... MSA*
2. Davis Hose Mask. Approval BM-1902 ..... DEE
3. Bullard Hose Mask. Approval BM-1903 ..... EDB
4. Davis Hose Mask. Approval BM-1904 ..... DEE
5. M.S.A. Combination Hose Mask. Approval BM-1905A ..... MSA
6. Davis Hose Mask. Approval BM-1906 ..... DEE
7. LaFrance Fresh Air Mask. Extension of approval BM-1905A ..... ALaF
8. Acme Supplied-Air Respirator, Type A. Approval BM-1910 ..... APE

Photographs of approved Type A supplied-air respirators are shown in figure 7, p. 14.

TYPE B

Special Hose Masks Without Blowers

LIMITED respiratory protection against *deficiency of oxygen and all harmful gases, vapors, fumes, dusts, smokes and mists, because of no positive air supply without blower.*

1. Davis Air-Line Mask. Approval BM-1913 ... DEE*
2. Bullard Simplex Hose Mask. Approval BM-1916 EDB

Photographs of approved Type B supplied-air respirators are shown in figure 8, p. 16.

TYPE C

Air-Line Respirators

Resiratory protection against *deficiency of oxygen and all harmful gases, vapors, fumes, dusts, smokes and mists.*

1. M.S.A. Air-Line Respirator. Approval BM-1909 ..... MSA*
2. Willson Air-Line Respirator, Models GA, GB, GC. Approval BM-1912 ..... WP
3. Cesco No. 602 Healthguard Direct Air Mask. Approval BM-1917 ..... CES

Photographs of approved Type C supplied-air respirators are shown in figure 8, p. 16.

TYPE CE

Abrasive Blasting Helmets, Hoods, or Masks

Respiratory protection against *deficiency of oxygen and all harmful gases, vapors, fumes, dusts, smokes and mists, plus face protection against flying particles.*

1. M.S.A. Abrasive Mask. Approval BM-1907 ... MSA*
2. Pangborn Blast Helmet, Type DD-4. Approval BM-1908 ..... PC
3. Sly Purair Helmet. Approval BM-1911 ..... WWS
4. Willson No. 31 Abrasive Blasting Helmet. Approval BM-1914 ..... WP
5. Pangborn Blast Helmet, Type DF-2. Approval BM-1915 ..... PC
6. Cesco No. 602 Healthguard Mask. Approval BM-1918 ..... CES

Photographs of approved type CE supplied-air respirators are shown in figure 8, p. 16.

* Initials of manufacturer.

TYPE B SUPPLIED-AIR RESPIRATORS

Davir Airline Mask,
BM-1913

Bullard Simplex Hose Mask,
BM-1916

TYPE C SUPPLIED-AIR RESPIRATORS

M.S.A. Airline Respirator,
BM-1909

M.S.A. Airline Respirator,
BM-1409

Willson Airline Respirator,
BM-1912

Cesco No. 602 Healthguard Direct
Air Mask, BM-1917

Figure 8

TYPE CE SUPPLIED-AIR RESPIRATORS

M.S.A. Abrasive Mask,
BM-1907

Pangborn Blast Helmet,
DD-4 BM-1908

Sly Purair Helmet,
BM-1911

Willson Abrasive Blasting Helmet,
No. 31 BM-1914

Pangborn Blast Helmet,
DF-2 BM-1915

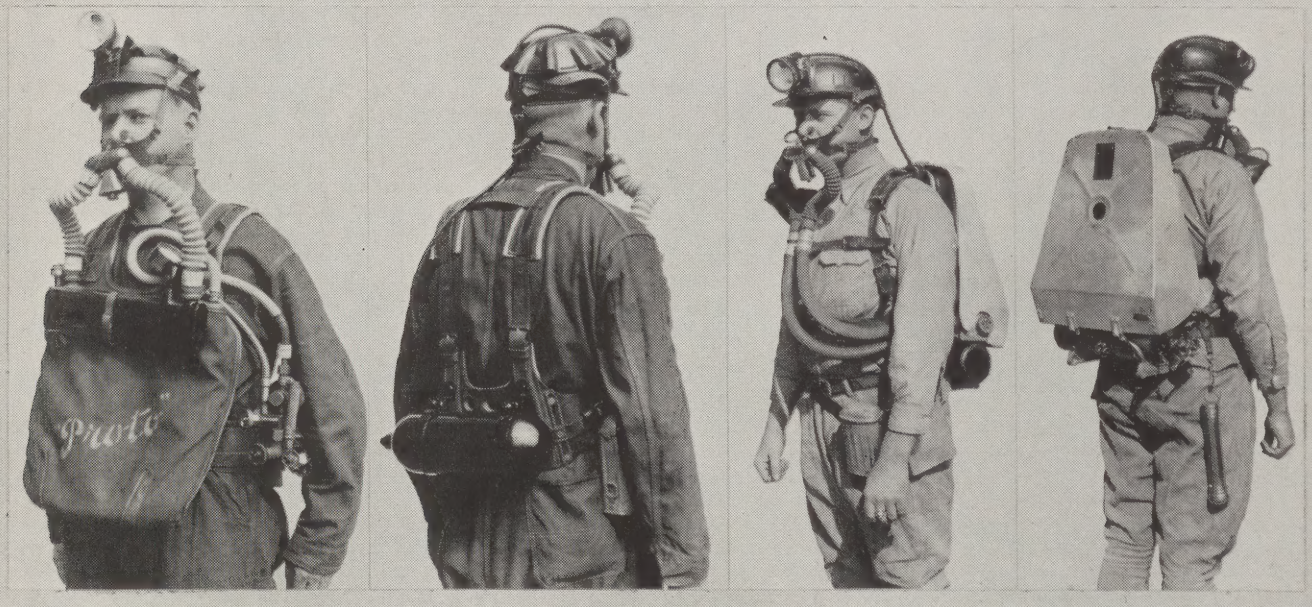
Cesco Health Guard Mask,
No. 602 BM-1918

Figure 9

SELF-CONTAINED OXYGEN BREATHING APPARATUS

Gibbs 2-Hour Apparatus (front and back views).
BM-1300

Paul 2-Hour Apparatus (front and back views).
BM-1301



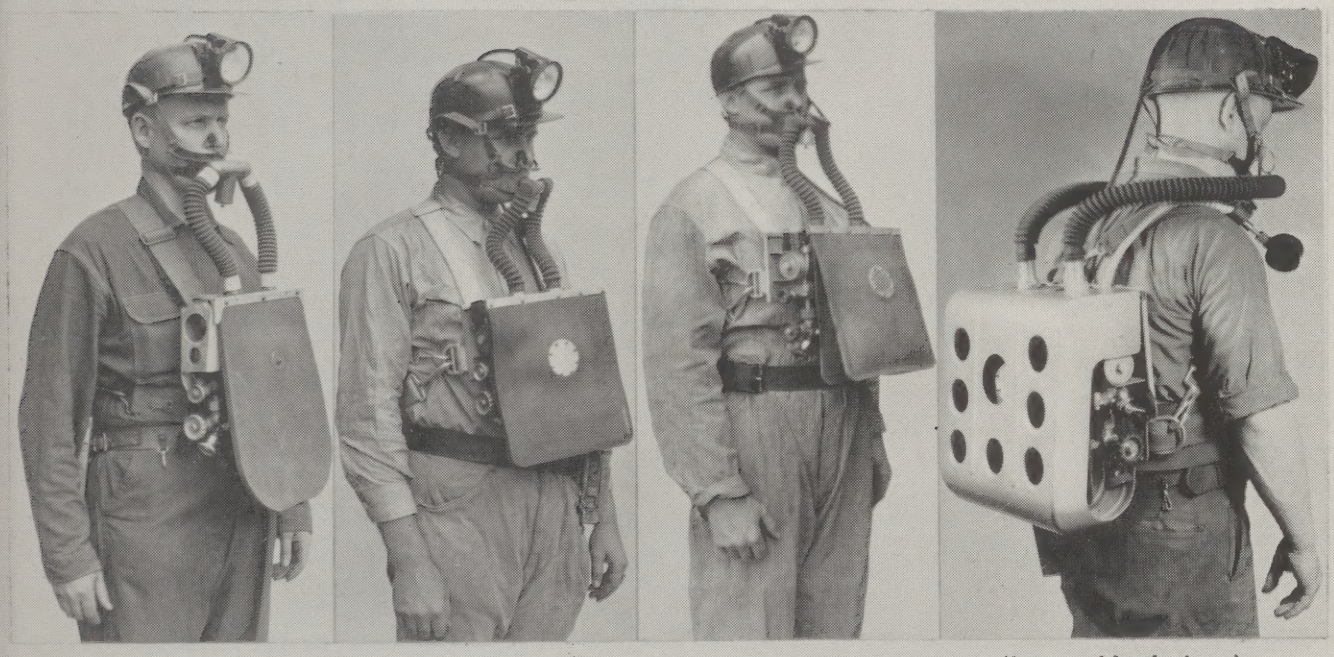
Fleuss-Davis 2-Hour Apparatus (front and back views).
BM-1302

McCaa 2-Hour Apparatus (front and back views).
BM-1303

Figure 10

SELF-CONTAINED OXYGEN BREATHING APPARATUS

Draeger (1924) 2-Hour Apparatus (with side tubes and shoulder tubes), BM-1304



McCaa

One-Half Hour Apparatus, BM-1305

M.S.A.

M.S.A. 1-Hour Apparatus (front and back views), BM-1306

Figure 11

SELF-CONTAINED OXYGEN BREATHING APPARATUS

Self-Contained Oxygen Breathing Apparatus

Respiratory protection against *deficiency of oxygen and all harmful gases, vapors, fumes, dusts, smokes and mists.*

1. Gibbs Oxygen Breathing Apparatus. Approval BM-1300 ..... MSA*
2. Paul Oxygen Breathing Apparatus. Approval BM-1301 ..... MSA
3. Fleuss-Davis Proto Oxygen Breathing Apparatus. Approval BM-1302 ..... SG
4. McCaa Oxygen Breathing Apparatus. Approval BM-1303 ..... MSA
5. Draeger Oxygen Breathing Apparatus. (1924 type.) Approval BM-1304 ..... DW
6. McCaa Half-Hour Oxygen Breathing Apparatus. Approval BM-1305 ..... MSA
7. McCaa One-Hour Oxygen Breathing Apparatus. Approval BM-1306 ..... MSA

Photographs of approved oxygen breathing apparatus are shown in figures 10 and 11, pp. 18 and 19.

NAMES AND ADDRESSES OF COMPANIES THAT HAVE RECEIVED APPROVALS

Acme Protection Equipment Co., 3616 Liberty Ave., Pittsburgh, Pa.

American-LaFrance and Foamite Industries, Inc., Elmira, N. Y.

American Optical Co., Southbridge, Mass.

E. D. Bullard Co., 275 8th St., San Francisco, Calif.

Chicago Eye Shield Co., 2300 Warren Boulevard, Chicago, Ill.

H. S. Cover, Station A., South Bend, Ind.

Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark, N. J.

The DeVilbiss Co., Toledo, Ohio.

Draegerwerk, Lubeck, Germany.

Hygeia Filtering Corporation (formerly the Hygeia Respirator Co.), 129 East 85th St., New York, N. Y.

B. F. McDonald Co., 1248 S. Hope St., Los Angeles, Calif.

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

Pangborn Corporation, Hagerstown, Md.

Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y.

W. W. Sly Manufacturing Co., 4700 Train Ave., Cleveland, Ohio.

Standard Safety Equipment Co., 75 E. Wacker Drive, Chicago, Ill.

Siebe, Gorman & Co., Ltd., London, England.

Willson Products, Inc., Reading, Pa.

Photographic Acknowledgments

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Figures 1, 2, 3, 4, 6, 7, 8, 9 and 10, courtesy of Dr. H. L. Schrenk, Director of the United States Bureau of Mines Experimental Station, Pittsburgh, Pa.

Figure 5, courtesy of Mine Safety Appliance Company and Willson Products Company.